

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

Claims 1-19 (canceled)

20. (original) A method of making an optoelectronic device comprising:
 - a. providing a first substrate;
 - b. forming at least one dielectric waveguide in the first substrate;
 - c. providing a second substrate having layers or islands of semiconductor material grown thereon;
 - d. bonding an upper most layer of the second substrate onto an exposed surface of the first substrate; and
 - e. etching at least portions of the layers or islands of semiconductor material initially grown on the second substrate to define at least one active device, the at least one active device being physically bonded to the first substrate and optically coupled to the at least one dielectric waveguide in the first substrate.
21. (original) The method of claim 20 further including removing the second substrate leaving, on the first substrate, the layers or islands of semiconductor material initially grown on the second substrate.
22. (original) The method of claim 20 wherein the at least one dielectric waveguide is formed in the first substrate adjacent a first surface thereof and wherein in step d the exposed surface is said first surface.

23. (original) The method of claim 20 wherein the optoelectronic device wherein the layers or islands of semiconductor material have adjacent layers of P, I and N material, with the N material layer being closer to the at least one dielectric waveguide in the substrate than is the P material layer.
24. (original) The method of claim 20 wherein the at least one dielectric waveguide is formed in the first substrate adjacent a first surface thereof and further comprising depositing a bonding interface layer onto at least one of the upper most layers of the second substrate and the first surface of the first substrate.
25. (original) The method of claim 24 wherein the bonding interface layer comprises: BPSG, BSG, SiO₂, SiN or SOG or combinations thereof.
26. (original) The method of claim 24 wherein the bonding interface layer has a thickness and index of refraction adapted to facilitate optical coupling between the at least one active device and said at least one waveguide.
27. (original) The method of claim 24 wherein the bonding interface layer improves adhesion between the at least one active device and said at least one waveguide.
28. (original) The method of claim 20 wherein step d comprises pressing the upper most layer of the second substrate onto the exposed surface of the first substrate to form a bond therebetween and annealing the first and second substrates to a temperature sufficient to strengthen the bond.
29. (original) The method of claim 20 wherein step e includes etching the layers or islands of semiconductor material initially grown on the second substrate to define a plurality of different active devices.

30. (original) The method of claim 20 wherein step c includes providing a plurality of second substrates each having layers or islands of semiconductor material grown thereon; wherein step d includes bonding an upper most layer of the plurality second substrates onto the exposed surface of the first substrate; and wherein step e includes etching the layers or islands of semiconductor material initially grown on the plurality of second substrates to define a plurality of different active devices.
31. (original) The method of claim 20 wherein step e includes etching the layers or islands of semiconductor material initially grown on the second substrate to define a plurality of different active devices having different physical shapes.
32. (original) The method of claim 31 wherein the layers or islands of semiconductor material initially grown on the second substrate comprises P, I and N layers, the N layer being disposed adjacent the substrate in step d, the I layer being disposed on the N layer and the P layer being disposed on the I layer.
33. (original) The method of claim 32 wherein the P and I layers of at least one active device being etched to have a common width in a cross section view taken perpendicular to the at least one waveguide and the N layer of said at least one active device being etched to be wider than said P and I layers of said at least one active device in at least one cross section view taken perpendicular to the at least one waveguide.
34. (original) The method of claim 33 wherein step e includes etching at least one elongated tapered element from the N layer, the at least one elongated tapered element having a major axis which is centered on a longitudinal axis of the at least one waveguide.

35. (original) The method of claim 31 wherein the P, I and N layers of at least one active device being etched to have a common outside diameter and the P and I layers of said at least one active device being etched to define an annulus therein.
36. (currently amended) The method of claim 35 ~~wherein~~ further including forming a metal contact layer on an exposed annular portion of the P layer and forming another metal contact in contact with the N layer in said annulus.
37. (original) The method of claim 36 wherein the at least one active device is disk shaped and at least two dielectric waveguides are formed in the first substrate, the at least one active device being disposed over the at least two waveguides.
38. (original) The method of claim 37 wherein the disk shaped active device has a centerline and wherein waveguides each have centers and wherein the centers of the at least two dielectric waveguides are equally spaced from the centerline of the disk shaped active device.
39. (original) The method of claim 37 wherein the disk-shaped device is divided into two associated devices by etching notches in at least the P layer, with one of the associated devices having a relatively larger sized P layer and the other one of the associated devices having a relatively smaller sized P layer.
40. (currently amended) The method of claim 20 wherein the semiconductor material is selected from those semiconductor materials capable of generating light, detecting light, amplifying light or otherwise modulating the amplitude or phase of light.

41. (original) The method of claim 20 further including forming an outlet waveguide in the first substrate.

42. (original) The method of claim 41 wherein the outlet waveguide is disposed close to, but spaced from the at least one dielectric waveguide in the substrate and wherein a disk-shaped device is disposed over or immediately adjacent both the at least one dielectric waveguide in the substrate and the outlet waveguide for controlling the coupling of light from the at least one dielectric waveguide and into the outlet waveguide.

43. (original) The method of claim 42 wherein the disk-shaped device is divided into two associated devices by etching notches in at least the P layer, with one of the associated devices having a relatively larger sized P layer and the other one of the associated devices having a relatively smaller sized P layer.

44. (original) The method of claim 43 wherein the other one of the associated devices having the relatively smaller sized P layer is disposed over or adjacent the outlet waveguide disposed in said substrate.